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RICHMOND HILL

SEWAGE TREATMENT PLANT

ANNUAL REPORT

1960

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THE DIVISION OF PLANT OPERATIONS

ONTARIO WATER RESOURCES COMMISSION

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Richmond Hill : sewage treatment plant.

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THE RICHMOND HILL SEWAGE TREATMENT PLANT

I. INTRODUCTION

The present plant consists of three activated sludge treatment units in parallel and a common influent works. These three sections were completed in three separate stages. The first stage consisted of a primary clarifier, aeration tanks, secondary clarifier, digester and sludge drying beds. This original plant was rated at 180,000 Imperial gallons per day and was completed in 1951. The second extension was completed in 1956 and was a parallel of the 1951 plant. This addition represented an increase in the treatment capacity to 450,000 Imperial gallons per day.

The final addition to the plant was completed in 1958. At this time, an additional digester was added as well as an extension to the sludge drying beds. The plant is now able to employ two stage digestion. This extension increased the capacity of the sewage treatment plant by 970,000 Imperial gallons, and included the building of an influent works which serves each of the three extensions. The influent works consists of coarse screens, an aerated grit chamber and a barminutor. From there the sewage flow is split between the three sections. Any one section can be by-passed by closing a gate on the inlet to the primary clarifier of that section.

The two extensions to the plant over the relatively short period since 1951 have resulted from a rapid increase in population over the past nine years. The design population for the 1951 plant was taken as being 3,000 people. The two following design populations were 6,000 and 16,350.

The present plant is now capable of giving complete treatment to 1,635,000 gallons of sewage per day. This capacity is obtained by having a primary clarifier volume of 142,000 gallons, an aeration tank volume of 509,00 gallons and a final clarifier volume of 190,500 gallons.

There are two digesters at the present plant. The digester that was completed in 1951 serves as the secondary digester and has a capacity of 83,500 Imperial gallons. The primary digester completed in 1958 has a capacity of 245,000 Imperial gallons and is heated. Rapid digestion takes place in the primary digester while compaction and the formation of a good supernatant takes place in the secondary digester. Two stage digestion is utilized in order to decrease digestion tank volume requirement. The gas produced by digestion is utilized for heating the primary digestion tank.

The digested sludge that is removed from the digester is placed on sludge drying beds. There are 1,000 square yards of sludge drying beds at the plant giving an area of .56 sq. ft./capita. The sludge loses moisture, and hence volume, on the sludge beds and is eventually removed.

II. PLANT LOADING DURING 1960

A. Hydraulic Loading

During 1960, 335,916,900 gallons of raw sewage entered the influent works at the plant. This represents an average daily flow of 913,000 gallons of sewage. However, during the rainy periods this average daily flow was estimated to be four times that much. As a result, it was necessary to by-pass part of these heavy flows for 48 days of the year (13% of the time). The large flows that reached the plant during periods of heavy rain were the result of infiltration and storm water run off. It is estimated that the storm water run off represents most of this increase and results from drains being connected to the sewers. The hydraulic design of the plant was then surpassed for 13% of the time during the year.

Graph #1 shows the daily average flow per week and it can be seen from this that the weekly average daily flow exceeded the design capacity

during three weeks. This accounts for twenty-one of the 48 days the plant was by-passed. The other 27 days occurred in March, April, May and October.

The rapid fluctuations in flow affect the operation of the plant. It is difficult to maintain suspended solids in the aeration section when the flow can change by 250% overnight. From Graph #1 it is to be noted that during August, September, and October the flow is such that the 1958 and 1956 section would be sufficient and for most of that time the 1958 section would suffice. With these two sections in operation the flow need only increase to 1,420,000 gallons per day to reach the design capacity of the plant. If one attempts to keep all sections in operation to protect against storm runoffs the power costs would go up and there would be operating difficulties due to the lack of flow during the majority of the time.

It is to be noted that even though the daily averages for a week remain very constant during the summer and fall, there were lare fluctuations during these periods on specific days.

B. Suspended Solids and BOD Loading

Graph # 2 represents the BOD and suspended solids loading on the plant. The curves represent the average daily pounds, during a month, that are in the raw sewage. The two curves vary considerably with time but remain close together except from the latter part of August till the first week of November. This separation was caused by an increase in the BOD loading on the plant. This increase is believed to be caused by a local industry discharging wastes of a high BOD. It is believed that most of this increase was caused by wastes from the local cannery.

However, it should be noted from the graph that the BOD and suspended solids loadings were below the design capacity of the 1958 extension

except for the BOD loading during August, September and October. Even then the BOD loading was only slightly above the capacity of this section.

If the average BOD loading for the period having records is applied to the complete year the total pounds of BOD in the raw sewage was 605,000 or 302½ tons. Similarly, the total pounds of suspended solids in the raw sewage were 546,000 or 273 tons.

C. Summary

The sewage treatment plant received a fluctuating BOD and suspended solids loading during the year which did cause some operating difficulties. However, the major problem at the plant is supplied by the fluctuating and large hydraulic loadings. The plant's capacity was exceeded often during the past year with respect to hydraulic loading while its BOD and suspended solids loadings were rarely above the capacity of the 1958 section alone.

The sewage that had to be by-passed during the heavy flow period received chlorination before entering the receiving stream. However, there would still be a considerable amount of suspended solids and BOD discharged.

There are two possible solutions to the problems created by the excessive flows. The sewage that by-passes the plant could be channeled to storm tanks where it would receive at least primary treatment. This would decrease the BOD and suspended solids loading on the stream. This stream is very small and suffers noticeably from the BOD and suspended solids reaching it.

The other solution would be to remove all the drains that are believed to be connected to the sanitary sewers. This would greatly reduce the flows that reach the plant as a result of rainfall.

Some steps are required if the sewage plant is to operate as it was designed to and if the stream is to be protected.

III. OPERATING EXPENSE

The total cost of operation of the plant during 1960 was $31,988.01.

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Therefore, the cost per million gallons of sewage treated was $95.20 or approximately 9½¢ per 1,000 gallons. The population of Richmond Hill at the first of 1960 was 15,032. The operating cost per person for sewage disposal in Rhichmond Hill would then be $2.12 per year. These costs are based on the operating expense only and do not include the capital costs.

IV. OPERATION OF THE PLANT

The sewage treatment plant was under 16 hour supervision per day for seven days of the week during the past year. The plant is in a residential area and requires this amount of supervision in order to protect the residents from odors and foam. This supervision is supplied by a chief and four operators. During the summer months a casual operator was hired on an hourly basis to aid in cutting grass, painting, cleaning tanks and other odd jobs that must be done during the summer months.

A general clean up and repair of much of the mechanical and electrical equipment was carried out during the past year by the operators under the supervision , and with the aid of thehead office maintenance staff. The maintenance section also completed their lubrication and maintenance schedule for the plant and did a routine annual inspection of the equipment at the plant.

In addition to their normal duties at the plant, and the work mentioned above, the operators installed a spray system on the 1958 section of the plant to control foaming in the aeration tanks. They also repainted a large portion of the plant.

Due to the heavy hydraulic loads that were thrust on the plant periodically the operators had difficulty in maintaining the proper level of suspended solids in the aeration tanks. Under the direction of the head office staff, an attempt was made to build up solids with the aid of

ferric chloride. This was carried out by the chief operator during the latter part of the year and appears to have been successful. This procedure will enable the operator to build up solids quickly in his aeration tanks and speed up the overall time for recovery of the plant after heavy rains. However, the cause of this problem will still remain and it is probable that by-passing of the plant will have to be practiced again in 1961.

V. SUMMARY

During the year of 1960, the sewage treatment plant experienced some operating difficulties due to the flows from rainfall. The recommendations concerning this are included in the body of this report.

The BOD and suspended solids loadings were consistant and well within the capacity of the plant. An increase in the BOD loading was noted during the latter part of the summer, but with advanced warning to the operator this should not be too great a problem.

Some re-wiring, repainting and maintenance work in excess of a normal year's work was carried out by the operators of the plant in addition to their normal duties.

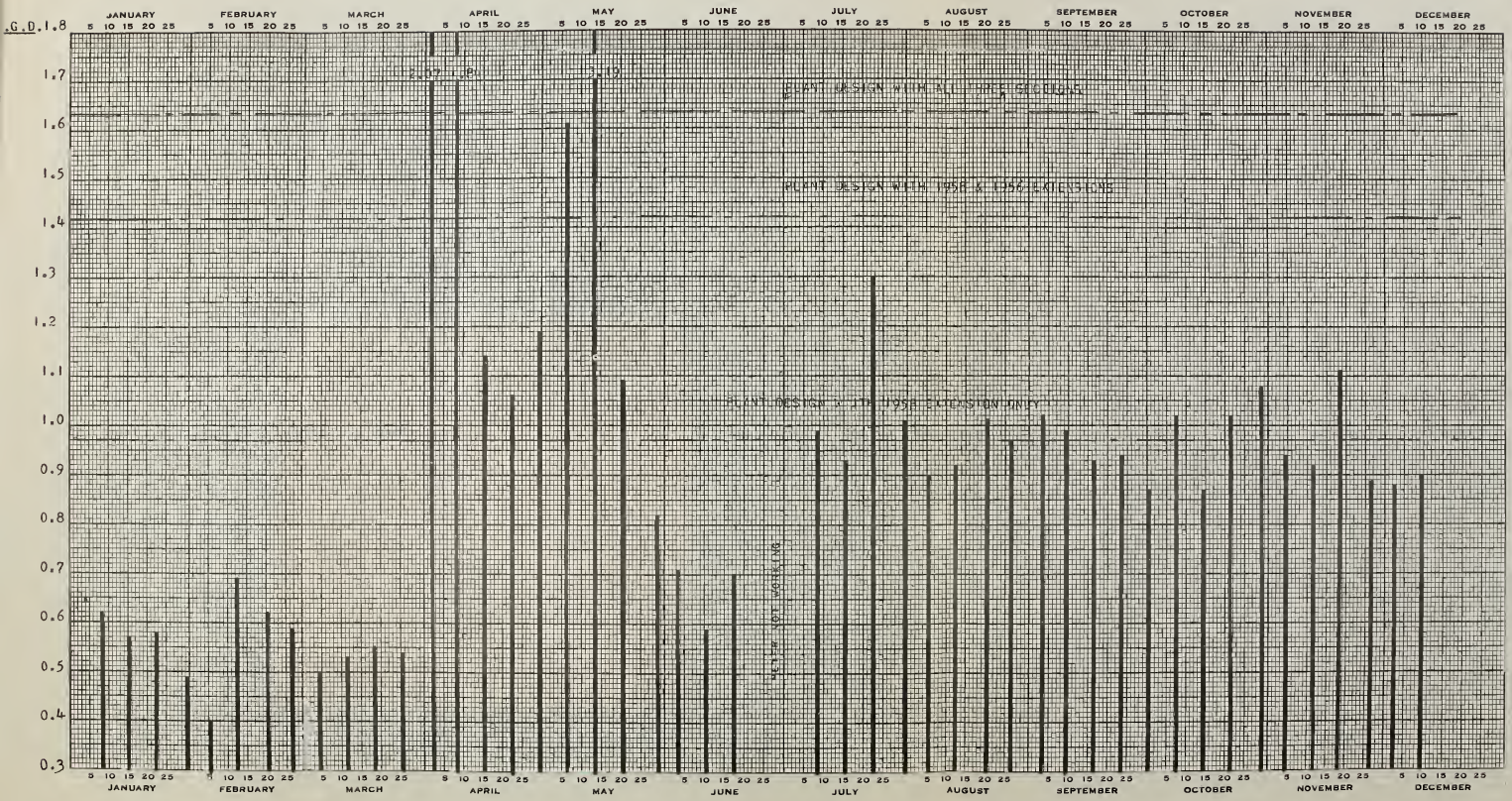
The average daily pounds of BOD and suspended solids in the raw sewage for each month.

MONTH	AVG. DAILY LBS. OF BOD	AVG. DAILY LBS. OF S.S.
JAN.		
FEB.		
MAR.	1770	1710
APR.	1150	1360
MAY	1830	1780
JUNE	945	945
JULY	1400	1220
AUG.	1870	1830
SEPT.	2200	1390
OCT.	2100	1680
NOV.	1770	1470
DEC.	1470	1580

1960

RICHMOND HILL SEWAGE TREATMENT PLANT

AVERAGE DAILY FLOW



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